



TREATMENT APPROACH FOR RESTORING THE PEG-SHAPED INCISORS

ÇİVİ DİŞ ŞEKLİNDEKİ YAN KESER DİŞLERİN RESTORASYONUNDA TEDAVİ YAKLAŞIMLARI

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ABSTRACT

This clinical report describes a treatment approach for restoring the esthetics of peg-shaped incisors.

Four patients were referred for the treatment of peg-shaped lateral incisors that caused esthetic problems. Intraoral examinations indicated that all four patients had good periodontal health and stable intercuspal positions, as well as normal vertical and horizontal overlaps, and canine-protected occlusion. The peg-shaped lateral incisors of three patients were restored directly with resin-based composite using different techniques, whereas one patient was restored with porcelain crowns.

The common occurrence of peg-shaped lateral incisors means that practitioners should be trained in the art of careful interdisciplinary treatment planning, to obtain excellent results. This clinical report describes a treatment approach for restoring the esthetics of peg-shaped incisors.

Keywords: Dental veneers, peg-shaped incisors, tooth abnormalities

ÖZET

Normal boyutlardan daha küçük ve genellikle konik formdaki yan keserler, "çivi diş" (peg lateral) olarak adlandırılmaktadır. Bu olgu sunumu, çivi diş şeklindeki laterallerin estetik rehabilitasyonunda, tedavi yaklaşımlarını göstermektedir.

Çivi diş formunda yan keser dişleri olan dört hasta, estetik şikâyetlerle kliniğimize müracaat etmiştir. Yapılan ağız içi muayenede dört hastanın da periodontal dokularının sağlıklı olduğu, tüberkül ilişkilerinin normal olduğu gözlenmiştir. Oklüzyon şekli kanin koruyucudur ve ilgili dişler arasında yatay ve dikey yönde restorasyon için yeterli hacmin olduğu gözlemlenmiştir. Üç hastadaki çivi şeklinde yan keser dişler rezin esaslı kompozit materyal ile üç farklı teknik uygulanarak tedavi edilirken, diğer hasta porselen kron ile tedavi edilmiştir.

Çivi şeklinde yan keser dişlerin estetik olarak düzeltilmesinde interdisipliner planlama, hekimin tecrübe ve yetenekleri ile birleştirilince en iyi sonuç alınacaktır. Bu olgu sunumu, çivi şeklinde yan keser dişlerin, estetik olarak restorasyonu için yapılabilecek tedavi yaklaşımlarını açıklamaktadır.

Anahtar Kelimeler: Dental venerler, çivi diş, diş anomalileri

INTRODUCTION

Various types of developmental aberrations are common in teeth, including abnormalities in the structure of enamel and dentin, as well as in the shape, size, and number of teeth.^{1,2}

Dental anomalies involving the number of teeth include hypodontia (one or more missing teeth), oligodontia (six or more missing teeth), anodontia

(complete absence of teeth), and hyperdontia (one or more extra teeth, also known as supernumeraries). Alterations in the size of the teeth include microdontia (teeth smaller than normal) and macrodontia (teeth larger than normal); both these conditions may either be generalized and involve all the teeth, or isolated to only one or several teeth. Variations in the shape of the teeth include double teeth (fusion and gemination), talon cusp, dens evaginatus, and dens

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invaginatus (dens in dente).³ Early diagnosis of dental anomalies, particularly in the primary dentition, allows for comprehensive long-term treatment planning, a more favorable prognosis, and in certain instances, less extensive intervention.⁴⁻⁶

In microdontia, the teeth are 1 mm smaller than normal teeth and their antimeres. Three types of microdontia are recognized, including true generalized microdontia, relative generalized microdontia, and localized microdontia.⁷ In true generalized microdontia, which is extremely rare, all the teeth are smaller in size than normal. In relative generalized microdontia, all the teeth are normal or slightly smaller, but because of larger than normal jaws, an illusion of microdontia is created. On the other hand, localized microdontia, , involves only a single tooth, and is less common in primary dentition than in permanent dentition.⁷

A peg lateral is defined as "an undersized, tapered maxillary lateral incisor"⁸ that may be associated with other dental anomalies such as canine transposition and over-retained deciduous teeth. The prevalence of peg-shaped maxillary lateral incisors is reported to be higher than that of other developmental malformations of teeth. In a study by Backman and Wahlin,⁹ the incidence of peg-shaped incisors was found to be 0.8% in 739 children, whereas in another study, the incidence was reported to be 0.4%.¹⁰ al-Emran reported that the occurrence of hypodontia combined with developmental malformations of the permanent teeth was found to be 4%.¹¹ Several reports have described the association between the presence of peg-shaped maxillary lateral incisors and other developmental anomalies.¹²⁻¹⁵ For instance, Peck et al.¹² reported an increased such occurrence on the left side of the maxilla. In another recent study, female patients more frequently presented with hypodontia and microdontia than male patients, whereas a higher number of male patients presented with supernumerary teeth and macrodontia.¹⁶ Individuals with malformed lateral incisors often present with a diastema in the midline, which is caused by distal movement of the central incisors.¹⁷ Owing to their reduced size, malformed lateral incisors may also allow formation of other anterior diastemas. Unless other congenital etiologic factors or habits are present, these patients may exhibit otherwise normal dentitions.

Many factors to be considered in the restoration of peg lateral incisors, such as the patient's expectations as well as the clinician's expertise.^{18, 19} Microdontia and peg-shaped teeth must be restored in order to establish esthetics and to prevent damage of the periodontium. Treatment options include porcelain laminate veneers, metal-ceramic restorations, and all-ceramic crowns. Another alternative is a minimally invasive procedure using a direct resin-based composite bonding technique.¹⁹

This clinical report describes different technique of application of direct resin-based composite veneers in comparison to crown procedures for restoring the esthetic appearance of peg-shaped lateral incisors.

CASE REPORTS

Four patients with peg-shaped lateral incisors were referred to the Department of Restorative Dentistry clinic of Istanbul University Faculty of Dentistry. Each patient presented with a chief complaint of a "desire to improve esthetics" because of existing "spaces," or "small" lateral incisors. On examination, all four patients had good periodontal health and stable intercuspal positions, as well as normal vertical and horizontal overlaps, and canine-protected occlusion. In three of the patients, the peg-shaped lateral incisors were restored with direct resin-based composite laminate veneers, tooth preparation was not done to create a resistance and/or retention form, to avoid weakening the tooth. In the fourth patient, however, the peg-shaped lateral incisors were restored with porcelain crowns.

Case 1: In the first patient, the peg-shaped upper right lateral incisor was treated with a resin-based composite using a silicone guide (Figure 1A).

For this, fast-setting silicone impressions were made of the maxillary and mandibular arches using a polydimethylsiloxane material (Zetaplus, Zhermack, Rovigo, Italy), and dental stone models were prepared thereafter. The desired shape of the tooth was waxed-up on the maxillary cast (Figure 1B). A good-quality silicone matrix was prepared to accurately reproduce the palatal anatomy and incisal edge of the maxillary anterior tooth. Using a surgical blade, the impression was sectioned at about half the thickness of the incisal border. The silicone matrix was tried for accuracy of fit

(Figure 1C). Only the lingual half of the guide was used in this technique. The cut guide was slightly reduced, but still maintained half the thickness of the incisal border. Once the custom matrix was obtained, it was set aside for later use, when the restoration would be built up.



Figure 1. Lateral incisor treatment with silicone guide. A) Baseline photograph B) Waxed-up on the maxillary cast C) Fitting of silicone matrix D) Final restoration

Tooth color was determined using a shade guide (VITA Easyshade Compact; Vita, Bad Säckingen, Germany) under ambient light. First, a retraction cord (Ultrapak; Ultradent, South Jordan, Utah, USA) was used to minimize crevicular fluid flow. The tooth was subsequently cleaned with pumice powder, taking care not to cause the gingiva to bleed. Next, the enamel was etched using a 37% phosphoric acid gel (Scotchbond Universal Etchant; 3M ESPE, St. Paul, Minnesota, USA) for 30 seconds; it was then rinsed thoroughly for 30 seconds, and the tooth was air-dried. To ensure proper enamel bonding, the adhesive system was applied according to the manufacturer's instructions (Single Bond Universal; 3M ESPE, St. Paul, Minnesota, USA) and polymerized for 20 seconds with a polymerizing unit (Optilux 501; Kerr, Middleton, Wisconsin, USA). Before curing the adhesive, it was verified that there was no contact with adjacent teeth.

To construct the palatal enamel and incisal edge, a resin-based composite was used as the first layer (Filtek Ultimate; 3M ESPE, St. Paul, Minnesota, USA). This resin-based composite was extruded onto the palatal aspect of the teeth, following which; a 1.5-mm-thick lingual shell of material was sculpted with a contouring instrument using the silicone matrix as a guide. The first increment was polymerized with the silicone matrix in the correct position. Then, the matrix

was removed, and polymerization was completed through the palatal surface. After determining the cervicoincisal length, incremental applications of the resin-based composite were made and properly cured. Finally, the occlusion was checked. Finishing, polishing, and occlusal adjustments were performed using diamond burs, polishing discs (Sof-Lex Discs; 3M ESPE, St. Paul, MN, USA), and finishing strips (Finishing Strips; 3M ESPE). At the end of this procedure, the importance of effective and rigorous oral hygiene was re-emphasized to the patient (Figure 1D).

Case 2: In the second patient, the peg-shaped upper right lateral incisor was treated with a resin-based composite using a cellulose acetate crown (Figure 2A).

For this, a cellulose acetate crown (CAC) (Strip Crown Forms; 3M ESPE) was selected to reproduce the original anatomy of the tooth, and customized to fit the remaining dental tissue. The CAC was selected based on the mesiodistal width of the tooth. It was then trimmed with scissors to achieve a good gingival fit. The same procedures were used for color determination and adhesion as described in Case 1.



Figure 2. Lateral incisor treatment with cellulose acetate crown A) Baseline photograph B) Fitting the cellulose acetate crown C) Placing the cellulose acetate crown D) Final restoration

A hole was punched in the palatal surface of the CAC using a sharp explorer point, to act as a vent when placing the resin-based composite-filled crown (Figure 2B). The CAC was then filled with the resin-based composite and inserted with pressure onto the peg-shaped upper right lateral incisor (Figure 2C). After polymerization on the buccal and palatal surfaces, the CAC was removed. Finishing, polishing, and occlu-

sal adjustments were performed using diamond burs, polishing discs, and finishing strips (Figure 2D). Patient was ordained to the periodontology clinic for gingival formation of the central incisors.

Case 3: In the third patient, the peg-shaped upper right lateral incisor was treated with a resin-based composite using an incremental method to implement a free hand modeling technique (Figure 3A-B). However the patient did not want to close the diastema between his central incisors.

The same procedures were used for color determination and adhesion as described in Case 1. A Mylar strip (Mylar; DuPont, Wilmington, Delaware, USA) was placed mesially between upper right lateral incisor and upper right central incisor (Figure 3B). Using a swing motion, the strip was placed labiopalatally, and the resin-based composite was applied interproximally to roughly determine the labial embrasure anatomy. Excess resin-based composite was removed and the correct embrasure form was achieved using a carver. Next, the resin-based composite was applied in a single increment to the palatal aspect and contoured using a burnisher, to shape the fossa. The strip was gently folded over the resin-based composite and pulled in a labiopalatal direction, while applying gentle digital pressure. The distal contour was formed in the same manner. A resin-based composite was then applied against the labial aspect. A hand instrument was used to smear it to create a veneer with the anatomically correct emergence profile, both cervicoincisally and mesiodistally. Finishing, polishing, and occlusal adjustments were performed using diamond burs, polishing discs, and finishing strips (Figure 3C-D).



Figure 3. Lateral incisor treatment with free hand modeling technique A) Baseline photograph B) Baseline photograph different view C) Final restoration D) Final restoration different view

Case 4: In the fourth patient, the peg-shaped upper lateral incisors and left canine were treated with porcelain veneers (Figure 4A).

The peg-shaped upper lateral incisors and left canine were minimally prepared to receive porcelain veneers. Tooth preparation involved only the smoothing of surface irregularities as well as the removal of unsupported enamel. Deep chamfer finish lines were given using round end taper diamond bur (Komet, S6856.FG.016 Gebr. Brasseler GmbH & Co. Germany). Finish lines were kept at the minimum tooth structure to remain untouched (Figure 4B). The same procedure was used for color determination as described in Case 1.



Figure 4. Lateral incisor treatment with porcelain veneers A) Baseline photograph B) Preparation of the tooth C) Leucite-reinforced ceramics D) Final restorations

First, retraction cords were used for gingival displacement. The impression was made using a polydimethylsiloxane material. The porcelain veneers were made of a leucite-reinforced ceramic (IPS Empress Esthetic; Ivoclar-Vivadent, Schaan, Liechtenstein) (Figure 4C). The veneers were first checked for seating, marginal fit and occlusion on the stone die, and then on the tooth preparation. After try-in procedures, the internal surfaces of the veneers were thoroughly rinsed with a water spray and air-dried. In order to obtain effective bonding to the leucite-based ceramic, micromechanical interlocking was ensured by etching with 10% hydrofluoric acid for 60 seconds, and chemical coupling with a silane (RelyX; 3M ESPE). The teeth were etched with a 37% phosphoric acid gel for 30 seconds and rinsed thoroughly for 30 seconds before being air-dried. To ensure proper enamel bonding, the adhesive system was applied according to the manufacturer's instructions and polymerized for 20 seconds with a polymerizing unit. A coat of adhesive resin was also applied to the internal surface of the veneers. It was

air-thinned but not light-cured, to avoid interfering with the marginal fit. The resin cement (Duolink; Bisco, Schaumburg, Illinois, USA) was dispensed directly into the veneers and the restorations, seated slowly. Any excess was removed using a microbrush prior to light-curing for 60 seconds with the same halogen polymerizing unit. Curing was initiated from the buccal surface, and followed by another 60 seconds at the palatal surface. Excess cement was checked and removed with dental floss (Figure 4D).

DISCUSSION

Currently, restoration of anterior teeth to a high level of functional integrity and aesthetic excellence is possible. Dentists today are comprehensively trained in the science of adhesive dentistry and can therefore carry out the mechanical steps necessary to achieve a sound restorative result quite easily. However, the artistic skills to simultaneously achieve a highly aesthetic restoration may prove elusive.

In previous studies, the prevalence of microdontia was reported as 0.1% and 0.6%.^{4,6,20-22} However, Meskin and Gorlin reported the incidence of peg-shaped teeth as 0.88%, with female patients displaying a slightly higher frequency (0.96%) than their male counterparts (0.83%).¹⁴ A 2:1 ratio was also reported for left-sided hypodontia and peg-shaping.¹⁴

A previous study found that microdontia occur more frequently in the maxillary teeth than the mandibular teeth, with the canines being the most affected teeth.²³ Adolescents and adults with microdontia typically desire a perfect mouth and smile, and an increasing number of such individuals visit clinicians to opt for dental restoration procedures.

The esthetic defect in patients with peg-shaped lateral incisors is the result of both, malformed teeth and the presence of a diastema between the teeth. There are therefore two primary treatment objectives: to restore or replace the malformed crowns, and to close the diastema. When diastema closure is performed, the dental midline and esthetic proportion of the individual tooth must be considered alongside the occlusal relationships.²⁴ Porcelain laminate veneers, metal-ceramic restorations, all-ceramic crowns, and resin based composite systems are suitable methods to address all these objectives.

Porcelain laminate veneers have a high abrasion resistance and color stability.²⁵ In addition,

their properties of color, form, surface, and individual characterization through internal and external staining, combined with the fact that these restorations can be further color-corrected during cementation with special cement colors, make them an attractive but expensive treatment option.^{25, 26}

Ceramic restorations are indicated for anterior crowns, posterior inlays, and onlays with impressive esthetic results. The advantages of this technique include a suitable marginal fit, minimal abrasion, acceptable esthetics, and conservative tooth preparation. When a qualified ceramist is engaged, the dentist can achieve desirable results.¹⁹ In the case of the fourth patient, we made three empress ceramic restorations. This technique is a good choice in cases involving numerous peg-shaped teeth. This approach is advantageous in that it reduce the time required on the dental chair and provides a good match in terms of color, form and surface characters

Esthetic bonding with resin-based composites may be the most conservative approach to this end because of the following reasons: sound tooth structure is not removed; the procedure does not require local anesthetic; the procedure may be accomplished in a single appointment, in a matter of hours; and it is relatively inexpensive.

The main disadvantage of such a technique, however, is the possibility of the veneers to chip and break. Additionally, discoloration and marginal leakage may occur by time. Such restorations absorb stains easily, and therefore patients who smoke and have poor oral hygiene cannot maintain these restorations for a long time.

The free-hand bonding technique, in contrast, allows complete control of each restorative step in the chair side repair of peg-shaped lateral incisors. Using an incremental technique, a restoration can be sculpted to the desired morphology and color, and the aesthetic outcome can be monitored right from shade selection until final polishing. In Case 3, we used the free-hand modeling technique. The operator applied different resin-based composites to create the ideal color match. Although difficult, we used a Mylar strip to recreate the palatal anatomy and proximal contacts. In this technique, the amount of excess resin-based composite is far greater than that in other techniques; therefore, more time is required for finishing and polishing.

The use of CAC in conjunction with the resin-based composite reduces operator chair time. This technique requires selection and adaptation of CAC on the cervical margins of the teeth, followed by reduction of excess resin-based composite around the gingival margin. It restores esthetics and function, while eliminating laboratory processing and reducing costs. The CAC technique produces a glossy finish, thereby minimizing polishing procedures.²⁷ In a previous study, the CAC retention rate was demonstrated as 83% after 1.5 years, and 78% after 3 years in primary incisors. This finding suggests that the CAC technique is likely to be successful; therefore, when indicated for the treatment of carious primary incisors with adequate tooth structure after caries removal, especially where esthetic concerns predominate proves to be an excellent choice. The CAC technique also appears to have fewer negative effects on pulpal health.²⁸ We used this technique in Case 2. The best polishing and finishing results can be obtained after removing the CAC. However, it is sometimes difficult to recreate the shape of the tooth. A single type of resin-based composite may be applied to facilitate color matching in all cases. Finally, the CAC technique can be used in teeth that are relatively monochromatic, as the selected resin-based composite picks up the tooth color during retraction and reflection of light.

The use of resin-based composites with a silicone guide allows complete control of the palatal shape of the restoration and facilitates recreation of the ideal morphology in the incisal and proximal regions. An indirect mock-up technique with resin-based composite on a dental stone model allows the patient to visualize the anticipated results in the mouth before agreeing to treatment. It also allows the clinician to verify the contours of the restorations and color of the restoration prior to performing direct bonding. Free-hand direct resin-based composite build-ups are often challenging to the clinician, and so this practice may help in providing a predictable and successful clinical outcome.²⁹ We used this technique in Case 1. The operator was able to create the best palatal anatomy by applying different types of resin-based composites to ensure color stability and other optical considerations.

Direct resin-based composite bonding is an ideal treatment strategy for peg-shaped lateral incisors, as it is a conservative technique and the

composite can be placed directly on the tooth. The choice of restorative technique (full direct, free-hand, or semi-direct such as silicone guide or CACs) with resin-based composite depends upon the indications and considerations of each specific case, as well as the experience of the operator.³⁰ Selection of a restorative technique should also depend partly on preservation of natural tooth structure.³¹

In conclusion the common occurrence of peg-shaped lateral incisors means that practitioners should be trained in the art of careful interdisciplinary treatment planning, to obtain excellent results. Preserving the tooth structure should be the operator's foremost concern, as it ensures the longevity of the restoration, thereby making future interventions more feasible. Direct resin-based composite bonding is ideal as treatment for peg-shaped lateral incisors, as it is conservative and can be placed directly on the tooth. In other words, all bonding techniques that make it possible to preserve enamel should be favored where possible, especially when the minimum thickness of the restorative materials allow for such minimal restorations. However, when peg-shaped teeth are numerous, it is a good choice to use ceramic restorations.

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